ZELTEX

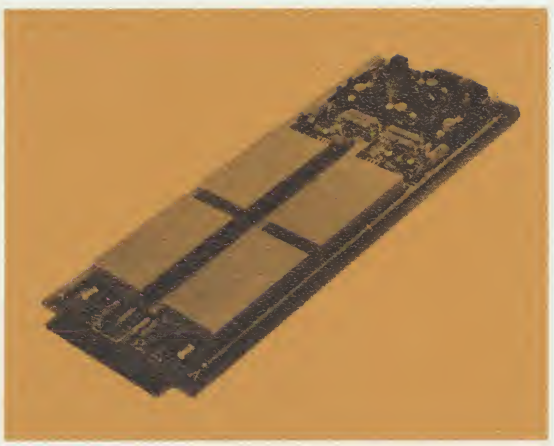
Analog Computer Elements

EFFECTIVE AUGUST, 1966

ZELTEX COMPUTER AMPLIFIERS

The Zeltex 500 Series Amplifiers have been specifically designed for operation in high speed analog computers and simulators. They use silicon semiconductors throughout and employ SOLID STATE (FET) chopper stabilization for greatest reliability. Two independent amplifiers are mounted on a single etched circuit card. Each amplifier has an overload light mounted on the front of the card, and overload indicating signals are also brought out at the rear connector. Individual chopper drive oscillators are built into each amplifier so that the only power required by the amplifiers is a single source of ±130 VDC. Internal chopper drive minimizes noise pickup at the chopper frequency and greatly reduces the complexity of installation.

Four different amplifiers are available in the Zeltex 500 Series; the economical Model 510, the more sophisticated Model 511 and high voltage versions of these two units. The basic 510 and 511 are powered from ±130 VDC and offer an output current of 30 ma at the ±100 V level. The high voltage counterparts to these units are powered from ±175 VDC and provide an output current of 50 ma at the 100 V level. Output excursions of ±150 volts peak are also available with load currents of 10 ma or less in the high voltage units. All amplifiers are unconditionally short circuit proof; amplifier output terminals can be shorted to ground, to the 100 volt reference level or to the power supply without damage.



SPECIFICATIONS

	Model 510	Model 511
Output characteristics		
Power Output	30 ma @ ±100 V	30 ma @ ±100 V
Frequency for full ±100 V output	DC to 25 KHz	DC to 25 KHz
Slewing rate	15 V/μsec	15 V/μsec
Gain @ DC	10^8	10^8
Offset voltage		
Initial offset	adjustable to zero	adjustable to zero
Temperature drift	2 μV/°C	1 μV/°C
Drift @ 25°C	20 μV/day	10 μV/day
Input current		
Offset @ 25°C	50 pa	10 pa
Temperature drift	1 pa/°C	0.2 pa/°C
Dynamic characteristics		
Gain-bandwidth product	500 KHz	1 MHz
Roll off rate	–6 db/octave	–6 db/octave
Frequency response (100K inv.)	150 KHz	300 KHz
Input impedance @ DC	1 meg	1 meg
Noise, RTI	1 mv, pp	300 μv, pp
Overload recovery time	4 sec	0.03 sec
Power requirements (per channel)	±130 VDC @ 15 ma no load	±130 VDC @ 15 ma no load

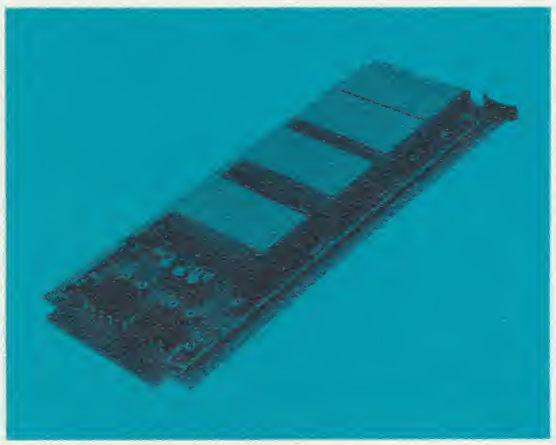
NOTE:
Models 510-HV and 511-HV have performance as above except for the following:

	Model 510-HV	Model 511-HV
Power output	50 ma @ ±100 V & 10 ma @ ±150 V	50 ma @ ±100 V & 10 ma @ ±150 V
Power requirements (per channel)	±175 VDC @ 25 ma no load	±175 VDC @ 25 ma no load

ZELTEX ELECTRONIC MULTIPLIERS

The Zeltex 500 Series Multipliers are a new class of Quarter Square Multipliers which employ small solid state operational amplifiers to assist in generating the square law function. The advantage of this technique is that the errors associated with diode drift with temperature are virtually eliminated and the number of precision resistors required in forming the square law function is greatly reduced. While this is a new design approach (Pat.Pending with Zeltex), experience with over 1,000 precision multipliers in the field has proven the reliability and soundness of design.

There are three different multipliers available in the Zeltex 500 Series: the Models 502, 502A and 503. Detailed specifications on each of these are shown below. The Model 502A has the two input inverting amplifiers built-in, and it does not require bipolar inputs. The other two versions require bipolar inputs. All multipliers require an output amplifier summing junction available. All units can be converted for division or dual squaring or root operation with an external closing contact.



SPECIFICATIONS

	Model 502	Model 502A	Model 503
Input characteristics			
Variables	$\pm X, \pm Y$	$+X, +Y$	$\pm X, \pm Y$
Voltage range, peak	$\lvert X\rvert + \lvert Y\rvert \leq 200$ V	± 105 V	$\lvert X\rvert + \lvert Y\rvert \leq 200$ V
Impedance, min.	50 Kohm	50 Kohm	40 Kohm
Output characteristics			
Variable	$-XY/100$	$-XY/100$	$-XY/100$
Range (@ output of amp with 100 Kohm feedback resistor)	± 100 V	± 100 V	± 100 V
Maximum static errors			
$X=0, Y=0$	2 mv	2 mv	2 mv
$X=0, Y=\pm 100$ V or $Y=0, X=\pm 100$ V	20 mv	20 mv	10 mv
$X=\pm 100$ V, $Y=\pm 100$ V	50 mv	50 mv	25 mv
Dynamic error, total			
@ 100 Hz	100 mv, pk	100 mv, pk	100 mv, pk
@ 1,000 Hz	1 V, pk	1 V, pk	1 V, pk
Frequency response, full output –3 db point at input to output amplifier	60 KHz	60 KHz	60 KHz
Output noise, DC to 60 KHz	15 mv, pp	15 mv, pp	15 mv, pp
Number of adjustments	2	2	2
Temperature coefficient	2 mv/°F	2 mv/°F	2 mv/°C
Power required	± 100 V @ 15 ma	± 100 V @ 20 ma ± 130 V @ 10 ma	± 100 V @ 3 ma ± 130 V @ 26 ma



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